

# The Role of Digital Literacy in Improving Students' Learning Outcomes

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DOI: <https://doi.org/10.47772/IJRISS.2026.100800852>

Received: 6 September 2026; Accepted: 11 September 2026; Published: 19 September 2026

## ABSTRACT

In the digital era, public libraries have emerged as important hubs for informal education particularly in promoting digital literacy among students. This study investigates the role of digital literacy in improving student learning outcomes at the Tun Razak Library (PTR) in Ipoh, Perak. It examines how students' abilities to evaluate information, use digital tools and participate in user education programs contribute to academic success. Despite increasing recognition of the importance of digital literacy, there is still a lack of empirical evidence in the context of Malaysian public libraries regarding its direct impact on measurable student outcomes. This study uses a quantitative research design and a structured questionnaire targeting students involved with PTR digital services. Data was analysed through descriptive statistics, Pearson correlation and multiple regression to identify the most effective digital literacy components. The findings are expected to provide actionable insights for library professionals, educators and policy makers in designing more effective digital literacy interventions in line with national education strategies and the MyDigital initiative. Finally, the research aims to position public libraries as important contributors to educational equity and student empowerment in the digital age.

**Keywords:** Digital Literacy, Information Literacy, Digital Tools, Students' Learning Outcome, Public Library

## INTRODUCTION

Digital literacy has become an essential foundation for academic success and personal development in the 21st century. As society continues to transition towards an information-based economy, the ability to access, evaluate, and effectively apply digital information has become increasingly important. Digital literacy encompasses a broad range of competencies, including the ability to use digital resources effectively, understand the ethical dimensions of online information, manage digital identities, and critically evaluate digital content and data.

According to Buchan et al. (2024), contemporary digital literacy extends beyond basic technological proficiency. It increasingly incorporates areas such as digital ethics, online safety, critical thinking, and responsible digital participation, equipping young people with the skills needed to succeed in both academic and civic environments. For students, particularly those in institutions of higher education, digital literacy is important not only for achieving academic success but also for supporting lifelong learning, enhancing employability, and promoting meaningful civic engagement.

In this context, public libraries have evolved from traditional repositories of printed materials into community-based learning centres that provide accessible and inclusive digital resources, technologies, and services. These services are particularly valuable for students who may have limited access to digital resources, facilities, or support at home or in educational institutions. Public libraries therefore play an increasingly important role in reducing digital inequalities and promoting digital empowerment within communities.

One significant example is the Tun Razak Library (PTR) in Ipoh, Perak, which serves as an important public institution in supporting students' educational needs and enhancing their digital capabilities. Through its

resources, facilities, and services, PTR has the potential to contribute significantly to the development of digital literacy and provide students with greater opportunities to access, evaluate, and utilise digital information effectively.

The library, managed by the Ipoh City Council, provides a wide range of digital services, including free internet access, computer facilities, online databases, digital reference collections, and user education programmes. These services play an important role in supporting students' access to and effective use of digital information resources. Hashim et al. (2022) highlighted that a trusted digital library environment, supported by reliable academic platforms and effective user assistance, can significantly influence how students engage with and benefit from online resources. Therefore, the digital services provided by PTR contribute to bridging the digital divide while creating a supportive and conducive environment for students to participate in contemporary digital learning.

As a public library serving thousands of users annually, including students from local schools, colleges, and technical institutes, the Tun Razak Library (PTR) plays an important role in enhancing digital literacy among young people. The library provides various initiatives, such as digital literacy workshops, ICT training modules, and digital user guides, to help students develop the skills needed to become effective and responsible users of information. Research by Mohamed Shuhidan et al. (2022) indicates that library-led informal learning activities can significantly strengthen digital literacy and learning engagement, particularly among undergraduate students. In addition to formal instruction, students can benefit from informal learning opportunities that allow them to explore digital tools, develop research skills, evaluate information critically, and practise responsible online behaviour within a safe and supportive environment. These initiatives are particularly valuable for students from underserved or disadvantaged backgrounds who may have limited access to reliable internet connectivity and digital learning resources at home. Similarly, Goek et al. (2023) found that digital literacy workshops provided by libraries can enhance digital literacy among disadvantaged students, highlighting the importance of accessible and inclusive public library programmes in reducing the digital divide.

This study aims to examine the role of digital literacy in enhancing students' learning outcomes at the Tun Razak Library (PTR), Ipoh. Specifically, the study seeks to determine the level of digital literacy among student users, evaluate the influence of the library's digital programmes on students' academic performance, and identify the digital literacy components that have the most significant impact on learning outcomes. The findings are expected to provide evidence-based insights to support library planning, resource allocation, and the development of future collaborations and partnerships with educational institutions. Hashim et al. (2022) demonstrated that well-designed digital infrastructure and effective user support systems significantly influence students' engagement with online services, highlighting the importance of digital library planning and policy development. Ultimately, this study underscores the need to strengthen digital literacy initiatives in public libraries to more effectively support students' academic achievement, lifelong learning, and personal development.

The study does not account for external variables such as students' prior knowledge, personal motivation, socio-economic background, or access to digital tools outside the library, all of which could influence learning outcomes independently of the library's digital literacy efforts. Despite these limitations, the study offers significant value by contributing localized, practical insights into how public libraries support student success through digital services. The findings may be used to guide improvements in digital literacy programs at Perpustakaan Tun Razak and serve as a foundation for future research involving comparative or longitudinal designs across multiple libraries or educational settings.

## LITERATURE REVIEW

### Evolution of Digital Literacy in Education and Libraries

Digital literacy has evolved beyond the narrow concept of basic computer use to encompass a broad range of competencies required to function effectively in an increasingly digital environment. In the educational context, digital literacy is no longer limited to proficiency in basic software applications; rather, it includes the

ability to navigate online information effectively, critically evaluate digital content, use digital tools for learning, and communicate responsibly in digital environments. This transformation requires public libraries to adapt their services by integrating digital literacy initiatives into their programmes and resources. Sa'ari et al. (2024) highlighted that digital literacy within the library context has developed substantially, moving from basic ICT skills towards intellectual innovation, instructional design, and the integration of advanced digital technologies. By providing appropriate training, digital tools, and learning resources, libraries can support the development of users' digital competencies while promoting lifelong learning and academic achievement. This transformation further positions public libraries as important spaces for digital empowerment, particularly for students who rely on library resources and services to support their academic needs. Similarly, Wan Mokhtar et al. (2024) found that students with higher levels of digital literacy, particularly in areas such as information evaluation, academic database usage, and citation management tools, demonstrated significantly better academic performance. These findings highlight the direct contribution of digital competencies to students' learning outcomes and reinforce the importance of strengthening digital literacy initiatives within library services.

### **Dimensions of Digital Literacy**

Digital literacy encompasses three interconnected dimensions: technical, cognitive, and ethical. The technical dimension refers to the ability to effectively use digital devices, software, online platforms, and internet-based services. The cognitive dimension involves the ability to locate, evaluate, interpret, and synthesise digital information critically. Meanwhile, the ethical dimension focuses on the responsible and appropriate use of digital information, including an understanding of digital rights, privacy, intellectual property, and the avoidance of plagiarism. Students are therefore expected to integrate these three dimensions into their academic practices to use digital resources effectively and responsibly. For instance, students may access academic databases using their technical skills, critically evaluate and select relevant sources through their cognitive abilities, and acknowledge information appropriately by applying ethical principles. Martínez-Bravo et al. (2022) supported this multidimensional perspective by explaining that contemporary digital competency models extend beyond technical proficiency to include cognitive abilities, such as information evaluation, and ethical responsibilities, including digital citizenship and responsible online behaviour. The integration of these dimensions is therefore essential for enabling students to navigate the complexities of academic work and make effective, critical, and ethical use of digital information in the digital age.

### **Expansion of Public Libraries as Learning Hubs**

Public libraries have evolved beyond their traditional role of lending printed books to becoming comprehensive learning and digital information hubs. By providing free access to digital technologies, internet facilities, online resources, and educational programmes, public libraries can support both formal and informal learning. According to Afni et al. (2024), public libraries have increasingly developed into digital learning environments that contribute to students' academic development, particularly for those with limited access to library and digital resources. This role can be further strengthened through sustainable collaborations between public libraries and educational institutions, including partnership programmes, joint training initiatives, and digital literacy activities designed to enhance students' digital competencies. Students who do not have access to institutional academic libraries may rely on public libraries for digital technologies, information resources, and research support. This situation is particularly relevant in semi-urban areas such as Ipoh, where the Tun Razak Library (PTR) serves as an important community information and learning centre. Consequently, public libraries play a significant role in supporting students in completing academic assignments, developing research skills, accessing digital information, and participating effectively in contemporary digital learning.

### **Benefits of Digital Library Services for Students**

The digital literacy services provided by the library play a significant role in supporting students' academic development and learning outcomes. According to Zulkifli and Wahid (2024), students who actively engage with academic digital library systems tend to experience higher levels of satisfaction and demonstrate greater effectiveness in acquiring academic information. Through structured digital literacy programmes, students can develop essential skills in evaluating information sources, applying appropriate citation practices, managing

digital content, and effectively navigating academic platforms and databases. These competencies are particularly important for academic writing, project development, research activities, and examination preparation. Furthermore, participation in library-led digital literacy programmes can enhance students' academic performance, increase their confidence in using digital technologies, and encourage greater engagement in the learning process.

## METHODOLOGY

Data were collected using a structured digital questionnaire developed through Google Forms and distributed to respondents via email and WhatsApp broadcasts. The target population consisted of active users of the Tun Razak Library (PTR), Ipoh, Perak, with a total of 132 valid responses obtained for the study. To enhance respondents' understanding of the questionnaire and minimise potential response bias, the instrument was provided in both English and Malay.

A quantitative research design was adopted as it was appropriate for examining the relationships between digital literacy and students' use of the library's digital services, including internet and computer facilities, academic databases, and reference tools. This approach enabled the systematic measurement of the study variables and facilitated statistical analysis to test the formulated hypotheses and address the research questions. Furthermore, the quantitative design allowed the researcher to identify patterns, trends, and relationships in respondents' use of digital library resources and their learning experiences. The use of established and validated measurement instruments also enhanced the consistency and internal reliability of the data collected. Overall, this approach was appropriate for identifying general trends within the targeted population while ensuring that the study focused specifically on library users who were most relevant to the research objectives.

## ANALYSIS AND FINDINGS

The study presents the findings of the quantitative analysis conducted on data collected from students who use the digital services provided by the Tun Razak Library (PTR), Ipoh, Perak. The Statistical Package for the Social Sciences (SPSS) was employed to analyse the collected data, address the research objectives, and test the hypotheses formulated for the study.

### Demographic Analysis

| Statistics |         |               |                    |                                                             |
|------------|---------|---------------|--------------------|-------------------------------------------------------------|
|            |         | Age /<br>Umur | Gender<br>/Jantina | Academic<br>level / Tahap<br>pengajian                      |
| N          | Valid   | 132           | 132                | 132                                                         |
|            | Missing | 0             | 0                  | 0                                                           |
|            |         |               |                    | Frequency<br>of PTR Use /<br>Kekerapan<br>penggunaan<br>PTR |

Table 1: Demographic statistics

The survey obtained 132 valid responses from student respondents, with no missing data recorded during the data collection process. The respondents comprised students from different levels of study, including undergraduate and postgraduate programmes. This finding indicates that the Tun Razak Library (PTR) serves a diverse student population and accommodates the academic information needs of users across various levels of higher education.

| Age / Umur  |           |         |               |                    |
|-------------|-----------|---------|---------------|--------------------|
|             | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid 18-19 | 12        | 9.09    | 9.09          | 9.09               |
| 20-21       | 17        | 12.88   | 12.88         | 21.97              |
| 22-23       | 26        | 19.70   | 19.70         | 41.67              |
| 24-25       | 56        | 42.42   | 42.42         | 84.09              |
| 26+         | 21        | 15.91   | 15.91         | 100.00             |
| Total       | 132       | 100.00  | 100.00        |                    |

Table 2: Age statistics

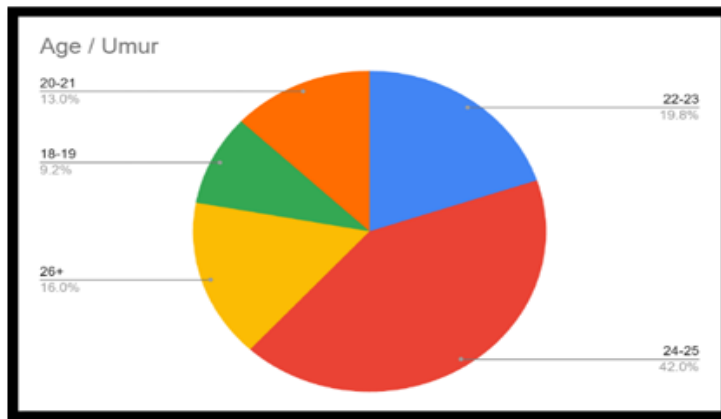


Figure 1: Age statistics

The age breakup of the respondents is such that, most of the respondents belonged to the young adult age. The largest group consisted of 24–25 years old students who constitute 42.42 per cent of the entire respondents (n=56). This was followed by students of 22- 23 years old, constituting 19.70 (n = 26). The number of respondents (26 years and older) was 15.91 (n = 21), and (20 to 21 years old) was 12.88 (n = 17). The last group consisted of students aged 1819 years and comprised 9.09% (n=12). The age cohort reveals that most of the respondents were in their advanced years of their academic life that considering the growing dependence on digital materials in their academic undertakings at advanced levels of academic activities that include research, assignments and presentations.

| Gender /Jantina |           |         |               |                    |
|-----------------|-----------|---------|---------------|--------------------|
|                 | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid male      | 64        | 48.48   | 48.48         | 48.48              |
| female          | 68        | 51.52   | 51.52         | 100.00             |
| Total           | 132       | 100.00  | 100.00        |                    |

Table 3: Gender statistics

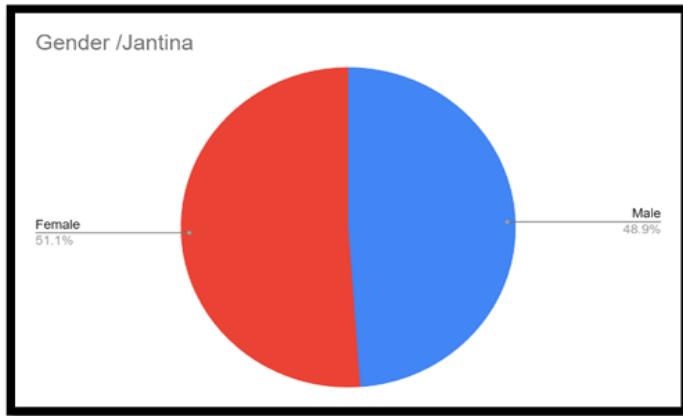


Figure 2: Gender statistics

The respondents demonstrated a relatively balanced gender distribution, comprising 68 female students (51.52%) and 64 male students (48.48%). This near-equal representation indicates a well-balanced gender composition within the sample. Such a distribution helps minimise potential gender bias and enhances the representativeness of the findings regarding the student users of the Tun Razak Library (PTR).

| Frequency of PTR Use / Kekerapan penggunaan PTR |           |         |               |                    |  |
|-------------------------------------------------|-----------|---------|---------------|--------------------|--|
|                                                 | Frequency | Percent | Valid Percent | Cumulative Percent |  |
| Valid Daily                                     | 33        | 25.00   | 25.00         | 25.00              |  |
| Weekly                                          | 54        | 40.91   | 40.91         | 65.91              |  |
| Monthly                                         | 35        | 26.52   | 26.52         | 92.42              |  |
| Rarely                                          | 4         | 3.03    | 3.03          | 95.45              |  |
| Never                                           | 6         | 4.55    | 4.55          | 100.00             |  |
| Total                                           | 132       | 100.00  | 100.00        |                    |  |

Table 4: Frequency of the library Use statistics

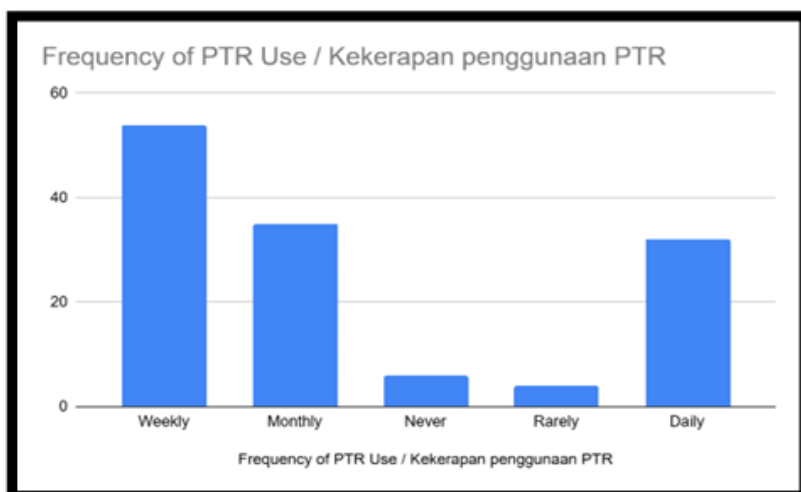


Figure 3: Frequency of PTR Use statistics

Regarding the frequency of using PTR digital services, the findings indicate high levels of engagement. Weekly users formed the largest group at 40.91% (n = 54), followed by daily users at 25.00% (n = 33). Monthly users accounted for 26.52% (n = 35). Only a small proportion of respondents reported using PTR digital services rarely (3.03%, n = 4) or never (4.55%, n = 6). Overall, 65.91% of respondents used PTR digital services either daily or weekly, highlighting PTR's role as a regular academic support facility for students.

## Descriptive Statistics

| Descriptive Statistics  |        |                |     |
|-------------------------|--------|----------------|-----|
|                         | Mean   | Std. Deviation | N   |
| Learningoutcomes        | 4.1712 | .67048         | 132 |
| Digitalliteracy         | 4.0364 | .79840         | 132 |
| UseofPTRdigitalservices | 4.0439 | .63646         | 132 |
| Additionalfeedback      | 2.8826 | .34872         | 132 |

Table 5: Descriptive statistics

This gives the descriptive statistics of the key variables analyzed in the research that revealed that the student learning outcomes registered the highest mean score (M = 4.17, SD = 0.67), which showed that the respondents perceived the strongest academic benefits. Digital literacy (M = 4.04, SD = 0.80) and use of PTR digital services (M = 4.04, SD = 0.64) also revealed high mean values, which indicated the positive levels of digital competence and usage of digital services in general. Conversely, other feedback also registered a lesser mean score (M = 2.88, SD = 0.35), implying ambivalent attitude towards additional improvements and issues concerning digital services. All the variables were determined based on 132 valid answers.

## Digital Literacy

| Statistics     |           |       |       |       |       |
|----------------|-----------|-------|-------|-------|-------|
|                | B1        | B2    | B3    | B4    | B5    |
| N              | Valid 132 | 132   | 132   | 132   | 132   |
|                | Missing 0 | 0     | 0     | 0     | 0     |
| Mean           | 4.20      | 4.14  | 3.80  | 3.91  | 4.14  |
| Std. Deviation | 1.044     | 1.153 | 1.283 | 1.149 | 1.010 |
| Minimum        | 1         | 1     | 1     | 1     | 1     |
| Maximum        | 5         | 5     | 5     | 5     | 5     |

Table 6: Digital Literacy

Digital literacy was assessed with the help of five items (B1-B5) and the total mean of this construct was 4.04 (SD = 0.80) which shows that the respondents were highly digital literate. The results indicate that most students have good digital skills that are required to do their studies.

In the case of the item, I can evaluate the credibility of online information, 87.88 percent of the respondents either agreed (40.91) or strongly agreed (46.97) with the statement as only 11.36 percent of the respondents disagreed. The average of 4.20 indicates that a significant number of students are very confident to evaluate the credibility of information online, which is one of the aspects of digital literacy.

In the question of confidence in the use of digital tools like MS word, Google Docs or online databases, 84.84% of the respondents responded in the affirmative or strongly in that they were very much confident in the use of digital tools. The average score of this question was 4.14 which points to the fact that the majority of students were not shy to use the necessary digital tools to facilitate their studying.

Knowledge regarding privacy and online security was measured by asking respondents whether they were aware of how to keep their privacy and security intact whilst using the internet, with the majority, 73.49, agreeing and strongly agreeing with the question and the minor percentage 18.94 indicating that they did not agree with the question. The average of 3.80 implies the moderate to high awareness but with some variation across students in this area of digital literacy.

To distinguish between reliable and unreliable online sources, about 76.52% of the respondents said that they either agreed or strongly agreed that they had this competency. The average of 3.91 suggests rather positive information evaluation capacities, but the percentage of neutral or uncertain respondents was rather low. Lastly, regarding the application of electronic tools to academic collaboration, including the Google Classroom and Microsoft Teams application, 85.61% of the respondents indicated that they could and strongly could use the applications. The average of 4.14 indicates the great knowledge of using collaborative digital tools, which confirms the general observation that the respondents are highly digitally literate.

### Use of PTR Digital Services

| Statistics     |         |       |      |       |       |      |
|----------------|---------|-------|------|-------|-------|------|
|                |         | C1    | C2   | C3    | C4    | C5   |
| N              | Valid   | 132   | 132  | 132   | 132   | 132  |
|                | Missing | 0     | 0    | 0     | 0     | 0    |
| Mean           |         | 4.05  | 4.14 | 3.89  | 4.06  | 4.08 |
| Std. Deviation |         | 1.086 | .854 | 1.082 | 1.025 | .981 |
| Minimum        |         | 1     | 1    | 1     | 1     | 1    |
| Maximum        |         | 5     | 5    | 5     | 5     | 5    |

Table 7: Use of PTR Digital Services

PTR digital services used registered a total mean score of 4.04 (SD = 0.64), which indicated that a high number of respondents engaged in the services. The findings show that students are taking advantage of the online services that Perpustakaan Tun Razak offers to meet their academic requirements. High rates of agreement and strong agreement were found in the fact that a significant percentage of respondents, 84.09, responded that they often used the electronic resources of PTR like e-books, journals, and databases. Also, 87.12 percentage of the respondents affirmed that the digital services offered by PTR were accessible and easy to use and this showed positive attitude towards the accessibility of services. With respect to the digital literacy training, 74.24 percent of the respondents responded as agreeable or strongly agreeable that PTR offers valuable user training or education in the field of digital literacy. More so, 84.09% of the respondents indicated that digital services of PTR allowed them to complete their assignments better or research better. Overall

satisfaction has 84.09 percent of respondents either agreeing or strongly agreeing that they were satisfied with the digital resources that PTR has to offer. On the whole these findings demonstrate that there is high usage and good perception of PTR digital services by student users.

### Student Learning Outcomes

|                |         | Statistics |      |       |       |      |
|----------------|---------|------------|------|-------|-------|------|
|                |         | D1         | D2   | D3    | D4    | D5   |
| N              | Valid   | 132        | 132  | 132   | 132   | 132  |
|                | Missing | 0          | 0    | 0     | 0     | 0    |
| Mean           |         | 4.17       | 4.23 | 4.18  | 4.17  | 4.09 |
| Std. Deviation |         | .992       | .956 | 1.025 | 1.008 | .945 |
| Minimum        |         | 1          | 1    | 1     | 1     | 1    |
| Maximum        |         | 5          | 5    | 5     | 5     | 5    |

Table 8: Student Learning Outcomes

Other feedbacks registered a lower average mean of 2.88, which represents conflicted perceptions of the respondents. Although the opinions of students about the digital services were on the positive side, a range of aspects that could be improved was noted. A significant percentage of the respondents, 86.37, consented or strongly consented that Perpustakaan Tun Razak (PTR) needed to offer more digital literacy classes. Meanwhile, 69.70 percent of the respondents believed that the current digital services offered by PTR met their academic needs. Notably, 89.39% of the respondents disagreed or strongly disagreed with the statement that they had challenges in lack of digital skills, which will mean that they have a lot of confidence in their digital skills. In addition, 85.61 percent of the respondents did not agree or strongly agreed that the access to the internet was a significant obstacle to the use of digital services of PTR. These results indicate that, although students tend to be digitally competent with a low level of barriers to access, there is a high need to increase training and digitally focused workshops.

### Correlation Analysis

|                     |                             | Correlations      |                  |                             |                     |
|---------------------|-----------------------------|-------------------|------------------|-----------------------------|---------------------|
|                     |                             | Learning outcomes | Digital literacy | Use of PTR Digital services | Additional feedback |
| Pearson Correlation | Learning outcomes           | 1.000             | .705             | .815                        | .163                |
|                     | Digital literacy            | .705              | 1.000            | .688                        | .176                |
|                     | Use of PTR digital services | .815              | .688             | 1.000                       | .146                |
|                     | Additional feedback         | .163              | .176             | .146                        | 1.000               |
| Sig. (1-tailed)     | Learning outcomes           | .                 | .001             | .001                        | .031                |
|                     | Digital literacy            | .001              | .                | .001                        | .022                |
|                     | Use of PTR digital services | .001              | .001             | .                           | .048                |
|                     | Additional feedback         | .031              | .022             | .048                        | .                   |
| N                   | Learning outcomes           | 132               | 132              | 132                         | 132                 |
|                     | Digital literacy            | 132               | 132              | 132                         | 132                 |
|                     | Use of PTR digital services | 132               | 132              | 132                         | 132                 |
|                     | Additional feedback         | 132               | 132              | 132                         | 132                 |

Table 9: Correlations

The Pearson correlation analysis was conducted to examine the relationships between digital literacy, the use of PTR's digital services, additional user feedback, and students' learning outcomes. The analysis aimed to determine the strength and direction of the associations between the independent variables and the dependent variable, namely students' learning outcomes.

The findings also show that there is a positive significant correlation between student learning outcomes and digital literacy ( $r = 0.705$ ,  $p = 0.001$ ). This implies that students who are more digitally literate are likely to record a better learning outcome, in terms of their academic performance, research capacity, and confidence in their ability to accomplish their academic tasks. This relationship strength shows that digital literacy is a significant factor in facilitating the learning process of students.

The use of PTR digital services and student learning outcomes had a very strong positive correlation ( $r = 0.815$ ,  $p = 0.001$ ). This means that the regular and successful utilization of PTR digital services includes internet based and online platforms are closely linked to increased student learning outcomes. Of all the variables, this relationship had the largest correlation coefficient implying that, the use of PTR digital services is most likely to be associated with the student learning outcomes.

There was also a strong positive relationship between digital literacy, and the use of PTR digital services, which was found to be significant ( $r = 0.688$ ,  $p = 0.001$ ). It means that more digitally literate students tend to use the active digital services offered by PTR which points to the integrated character of digital skills and using services.

Contrary to this, the other feedbacks indicated only weak positive relationship with student learning outcomes ( $r = 0.163$ ,  $p = 0.031$ ), digital literacy ( $r = 0.176$ ,  $p = 0.022$ ), and use of PTR digital services ( $r = 0.146$ ,  $p = 0.048$ ). Even though the relationships were statistically significant, the low values of correlation coefficients imply that there is a low relationship between additional feedback and the core variables as compared to digital literacy and use of digital services.

Altogether, correlation analysis shows that the variables of digital literacy and PTR digital services usage are highly correlated with the student learning outcomes, and further feedback indicates a weak connection. These results offer empirical evidence to go ahead and test them through multiple regression analysis.

## Hypothesis Testing

| Model Summary <sup>b</sup> |                   |          |                   |                            |                   |          |     |
|----------------------------|-------------------|----------|-------------------|----------------------------|-------------------|----------|-----|
| Model                      | R                 | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics |          |     |
|                            |                   |          |                   |                            | R Square Change   | F Change | df1 |
| 1                          | .839 <sup>a</sup> | .704     | .698              | .36873                     | .704              | 101.717  | 3   |

| Model Summary <sup>b</sup> |     |               |
|----------------------------|-----|---------------|
| Model                      | df2 | Sig. F Change |
| 1                          | 128 | .001          |

| ANOVA <sup>a</sup> |            |                |     |             |                   |
|--------------------|------------|----------------|-----|-------------|-------------------|
| Model              |            | Sum of Squares | df  | Mean Square | Sig.              |
| 1                  | Regression | 41.488         | 3   | 13.829      | .001 <sup>b</sup> |
|                    | Residual   | 17.403         | 128 | .136        |                   |
|                    | Total      | 58.891         | 131 |             |                   |

Table 10: Model Summary and ANOVA

This research suggested research hypotheses to look at the association between digital literacy, use of Perpustakaan Tun Razak (PTR) digital services, and student learning outcomes. Pearson correlation analysis and multiple regression analysis were employed to test the hypothesis as to the strength, direction and predictive power of relationships proposed.

The H1 hypothesis assumed that student learning outcomes are significantly related to digital literacy. The Pearson correlation analysis showed that there is a strong positive correlation between digital literacy and student learning outcomes ( $r = 0.705$ ,  $p = 0.001$ ). This finding implies that students who have a higher level of digital literacy are more prone to have better academic performance, have a strong research ability, and are more confident to accomplish academic tasks. With the p-value less than 0.05 significance level, the null was rejected, and H1 was accepted, which supported the fact that there was a significant relationship between digital literacy and student learning outcomes.

The second hypothesis (H2) was that PTR digital services can be significantly related to student learning outcomes. According to the findings of Pearson correlation analysis, there was an extremely strong positive correlation between the use of PTR digital services and the student learning outcomes ( $r = 0.815$ ,  $p = 0.001$ ). It means that the active and regular utilization of PTR digital services, including e-resources, online databases, and digital platforms is closely linked to the enhanced academic performance and learning efficiency. Since the correlation was strong and the p-value was statistically significant, H0 was rejected and H2 accepted.

In order to explore further the synergistic effect of the independent variables, the multiple regression analysis was performed using student learning outcomes as a dependent variable, digital literacy, utilization of PTR digital services, and other feedback as predictive variables. The regression model was also significant ( $F(3,128) = 101.717$ ,  $p = 0.001$ ) which means that the predictors as a group can only explain a substantial amount of variance in student learning outcomes. The model generated the  $R^2$  of 0.704 indicating that 70.4 percent of the variation in student learning outcomes can be attributed to the independent variables.

The standardized beta coefficients were analyzed and the results found that the strongest predictor of student learning outcomes was the use of PTR digital services ( $= 0.625$ ,  $p = 0.001$ ) and then digital literacy ( $= 0.270$ ,  $p = 0.001$ ). However, in contrast, other types of feedback did not have a statistically significant impact on the learning outcomes of students (0.025, 0.612). These results suggest that students' perception and feedback are relevant, but the actual digital literacy and active use of PTR digital services are the major factors in determining the learning outcomes.

In general, the results of testing hypotheses prove that the level of student learning depends on the level of digital literacy and the use of PTR digital services greatly, and the utilization of digital services proves to be the most impactful predictor. These results confirm the study design of the research and point to the significant importance of PTR to support academic learning of students using digital resources and services.

## CONCLUSION

In conclusion, this paper contributes to a deeper understanding of the role of digital literacy and digital library services in enhancing students' learning outcomes at the Tun Razak Library (PTR), Ipoh, Perak. The findings indicate that students with higher levels of digital literacy and more active engagement with digital library services are more likely to achieve positive academic outcomes. The study also highlights the importance of adopting a user-centred approach to library planning and management, particularly in responding to rapid technological developments and the evolving needs of library users. By strengthening digital literacy initiatives, improving access to digital resources and services, and promoting the effective use of digital technologies, libraries can enhance their relevance as essential learning and support institutions. Overall, the findings provide a foundation for further improvement of digital library services and encourage continued research and professional practice in digital literacy and student learning outcomes. The study further emphasises the need for continuous innovation, collaboration, and investment in digital library development to support lifelong learning and meet the changing demands of an increasingly digital society.

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